

CLAIMS:

1. An audio echo canceller, comprising:
 - a first decimeter configured to decimate an echo added input signal to produce an input sub-signal;
 - a model of an acoustic echo configured to produce an echo estimate;
 - a first subtractor configured to subtract the echo estimate from the input sub-signal;
 - a first filter configured to filter the input sub-signal;
 - a second subtractor configured to subtract the input sub-signal from a signal output by the first subtractor so as to provide an output sub-signal;
 - a second filter configured to filter the echo added input signal;
 - an interpolator configured to interpolate the output sub-signal output from the second subtractor so as to generate an interpolator output signal; and
 - an adding device configured to add the echo added input signal to the interpolator output signal.
2. The audio echo canceller according to claim 1, further comprising:
 - a first analyze filter configured to divide an output of said first decimator into a number of input sub-signals of respective sub frequency bands; and
 - a synthesize filter configured to combine a number of output sub-signals to an input of said interpolator.
3. The audio echo canceller according to claim 2, further comprising:
 - a second analyze filter configured to divide an output of a second decimator into said number of input signals of respective sub frequency bands, one of which is an input to said model of the acoustic echo.
4. The audio echo canceller according to claim 3, further comprising:
 - a control module configured to adjust a response of said first and second analyze filters based on the input sub-signal and a corresponding echo model input signal.
5. The audio echo canceller according to claim 3, wherein the first and the second decimators both include a low pass filter and a down sampler, and the interpolator includes an up sampler and a low pass filter.

6. The audio echo canceller according to claim 5, wherein at least one of the low pass filters include an FIR filter.

7. The audio echo canceller according to claim 5, wherein the first and second analyze filters, the synthesize filter and at least one of the low pass filters are linear phase.

8. The audio echo canceller according to claim 7, wherein the first and the second filters are time variant amplifiers.

9. The audio echo canceller according to claim 1, wherein the first and the second filters are amplifiers.

10. The audio echo canceller according to claim 1, further comprising:
one or more delay units disposed before and/or after, or integrated in, the second filter, which accumulated correspond to a delay appearing from the first decimator to the interpolator.

11. The audio echo canceller according to claim 1, wherein the model of the acoustic echo includes an FIR filter and an associated filter update algorithm.

12. The audio echo canceller according to claim 1, wherein said module of the acoustic echo further includes a miscellaneous processing unit including at least one of a residual echo masker, a noise reduction algorithm and a comfort noise generator.

13. The audio echo canceller according to claim 4, wherein the canceller is a part of a video conferencing system in which an input of the second decimator is a second audio signal captured by a microphone at a far end site including far end sound, and the echo added input signal is a first audio signal captured by a microphone at a near end site including at least one of near end sound, noise and the acoustic echo.

14. The audio echo canceller according to claim 4, wherein the canceller is a part of one of a telephone communication and a conferencing system in which an input of the second decimator is a second audio signal captured by a microphone at a far end site including far

end sound, and the echo added input signal is a first audio signal captured by a microphone at a near end site including at least one of near end sound, noise and the acoustic echo.

15. The audio echo canceller according to claim 4, wherein the canceller is a part of one of a mobile communication and a conferencing system in which an input of the second decimator is a second audio signal captured by a microphone at a far end site including far end sound, and echo added input signal is a first audio signal captured by a microphone at a near end site including at least one of near end sound, noise and the acoustic echo.

16. The audio echo canceller according to claim 13, wherein the control module detects at least one of a presence and a content of said first and second audio signal and to accordingly adjust said response.

17. The audio echo canceller according to claim 16, wherein the control module adjusts the response to a first positive non-zero value, less than or equal to one, if near end sound together with noise, or near end sound only is detected, and to a second zero value in all other cases.

18. The audio echo canceller according to claim 14, wherein the control module detects at least one of a presence and a content of said first and second audio signal and to accordingly adjust said response.

19. The audio echo canceller according to claim 18, wherein the control module adjusts the response to a first positive non-zero value, less than or equal to one, if near end sound together with noise, or near end sound only is detected, and to a second zero value in all other cases.

20. The audio echo canceller according to claim 15, wherein the control module detects at least one of a presence and a content of said first and second audio signal and to accordingly adjust said response.

21. The audio echo canceller according to claim 20, wherein the control module adjusts the response to a first positive non-zero value, less than or equal to one, if near end

sound together with noise, or near end sound only is detected, and to a second zero value in all other cases.

22. A method of canceling an audio echo, comprising the steps of:

a first decimating step of decimating an echo added input signal to produce an input sub-signal;

producing an echo estimate;

a first subtracting step of subtracting the echo estimate from the input sub-signal;

a filtering step of filtering the input sub-signal;

a second step of subtracting the input sub-signal from a signal output by the first subtracting step so as to provide an output sub-signal;

a second step of filtering the echo added input signal;

interpolating the output sub-signal output from the second subtracting step so as to generate an interpolator output signal; and

adding the echo added input signal to the interpolator output signal.

23. The method according to claim 22, further comprising the steps of:

a first step of dividing an output of said first decimating step into a number of input sub-signals of respective sub frequency bands; and

combining a number of output sub-signals to an input of said interpolating step.

24. The method according to claim 23, further comprising the step of:

a second step of dividing an output of a second decimating step into said number of input signals of respective sub frequency bands, one of which is an input to the step of producing the echo estimate.

25. The method according to claim 24, further comprising the step of:

adjusting a response of said first and second dividing steps based on the input sub-signal and a corresponding echo model input signal.

26. The method according to claim 24, wherein the first and the second decimating steps use a low pass filter and a down sampler, and the interpolating step uses an up sampler and a low pass filter.

27. The method according to claim 26, wherein at least one of the low pass filters includes an FIR filter.

28. The method according to claim 26, wherein the first and second dividing steps, the combining step and at least one of the low pass filters are linear phase.

29. The method according to claim 28, wherein the first and the second filtering steps use time variant amplifiers.

30. The method according to claim 22, wherein the first and the second filtering steps are amplifiers.

31. The method according to claim 22, wherein the step of producing the echo estimate uses a FIR filter and an associated filter update algorithm.